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IS 10352 (1992): Test Charts for Internal Cylindrical Grinding Machines with Horizontal Spindle [PGD 3: Machine Tools]



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IS 10352 : 1992
ISO 2407 : 1984

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(पहला पुनरीक्षण)

Indian Standard

TEST CHARTS FOR INTERNAL CYLINDRICAL
GRINDING MACHINES WITH HORIZONTAL SPINDLE
(*First Revision*)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 7

NATIONAL FOREWORD

This Indian Standard (First Revision) which is identical with ISO 2407 - 1984 'Acceptance conditions for internal cylindrical grinding machines with horizontal spindle — Testing of accuracy' issued by the International Organization for Standardization (ISO), has been adopted by the Bureau of Indian Standards on the recommendations of the Machine Tool Basics and Modular Units Sectional Committee (PE 03) and approved by the Production Engineering Division Council.

This standard was first issued in 1982 based on ISO 2407 : 1973. Consequent upon the revision of the ISO standard, this standard has been revised by adopting ISO 2407 : 1984, to bring it in line with ISO standard.

Certain conventions are, however, not identical to those used in Indian standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker in the International Standards while in Indian Standards the current practice is to use point (.) as the decimal marker.
- c) Some dimensions appear in 'inches' in the International Standard besides in metric systems while in Indian Standards, the current practice is to give metric values only.

In this adopted standard, reference appears to ISO/R 230 (*since revised as* ISO 230/1 : 1986). The Indian Standard IS 2063 : 1988 'Acceptance code for machine tools : Geometric accuracy of machines operating under no load or finishing conditions (*first revision*) which is identical with ISO 230/1 : 1986 is to be substituted in its place.

Indian Standard

TEST CHARTS FOR INTERNAL CYLINDRICAL GRINDING MACHINES WITH HORIZONTAL SPINDLE (*First Revision*)

1 SCOPE AND FIELD OF APPLICATION

This International Standard describes, with reference to ISO/R 230, both geometrical and practical tests on general purpose and normal accuracy internal cylindrical grinding machines with horizontal spindle, whether fitted with a surfacing wheel slide or not, and gives the corresponding permissible deviations.

Complementary geometrical tests and a practical test for machines with a surfacing wheel slide are given in the annex.

It deals only with the verification of accuracy of the machine. It does not apply to testing the running of the machine (vibrations, abnormal noises, stick-slip motion of components, etc.), or to its characteristics (speeds, feeds, etc.) which should generally be checked before testing accuracy.

2 PRELIMINARY REMARKS

2.1 In this International Standard, all the dimensions are expressed in millimetres and in inches.

2.2 To apply this International Standard, reference should be made to ISO/R 230, especially for the installation of the machine before testing, warming up of spindles and other moving parts, description of measuring methods and recommended accuracy of testing equipment.

2.3 The sequence in which the geometrical tests are given is related to the sub-assemblies of the machine, and this in no way defines the practical order of testing. In order to make the mounting of instruments or gauging easier, tests may be carried out in any order.

2.4 When inspecting a machine, it is not always necessary to carry out all the tests given in this International Standard. It is up to the user to choose, in agreement with the manufacturer, those relating to the properties which are of interest to him, but these tests are to be clearly stated when ordering a machine.

2.5 Practical tests shall be made with finishing cuts and not with roughing cuts which are liable to generate appreciable cutting forces.

2.6 When the tolerance is established for a measuring range different from that indicated in this International Standard (see 2.311 in ISO/R 230) it should be taken into consideration that the minimum value of tolerances is 0,001 mm (0.000 04 in).

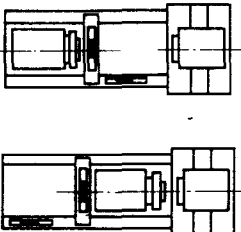
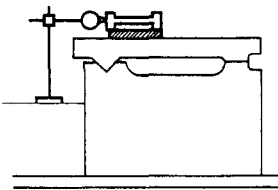
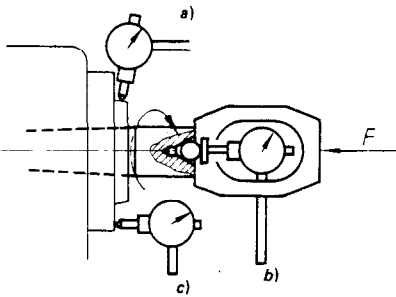
3 REFERENCE

ISO/R 230, *Machine tool test code*.

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4 ACCEPTANCE CONDITIONS AND PERMISSIBLE DEVIATIONS

4.1 Geometrical tests

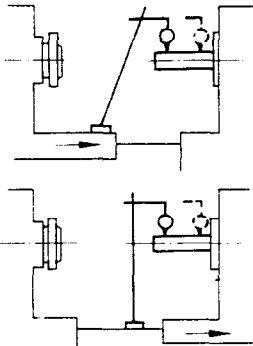
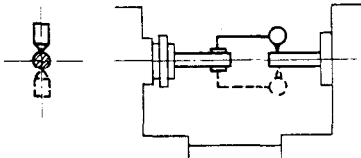
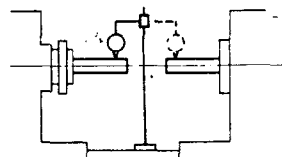
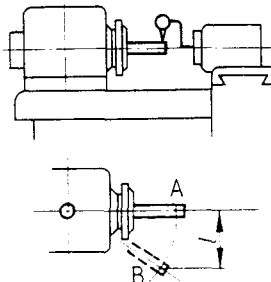
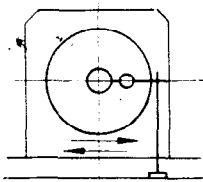
No.	Diagram	Object	Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
			mm	in		
G0		Levelling of the machine.	In the case of internal cylindrical grinding machines, no part is to be dismantled (especially in the case of slideways mounted on roller elements). It will be satisfactory to check the levelling with the aid of levels set longitudinally and transversely on the machine according to the manufacturer's specifications.			
G1		A – TABLE Checking of straightness of the table movement in the horizontal plane.	0,008 for a 300 mm travel	0.0003 for a 12 in travel	Straightedge and dial gauge	Clause 5.232.1 The dial gauge support shall be placed on a fixed part of the machine, the stylus touching a straightedge laid parallel to the general direction of the longitudinal movement of the table.
G2		B – WORKHEAD a) Measurement of run-out of the external register diameter of the spindle; b) Measurement of periodic axial slip of the work spindle; c) Measurement of camming of the register face of the spindle (including periodic axial slip).	a) 0,005 b) 0,005 c) 0,01	a) 0.0002 b) 0.0002 c) 0.0004	Dial gauge	a) Clause 5.612.2 In the case of a tapered spindle nose the stylus of the dial gauge shall be set normal to the surface to be checked. b) and c) Clauses 5.62, 5.621.2, 5.622.1, 5.622.2 and 5.632 For the dial gauge position, see Figures 59 to 64 and 67, clauses 5.62, 5.622 and 5.632. The value of force <i>F</i> to be applied for the tests a), b) and c) shall be specified by the manufacturer.

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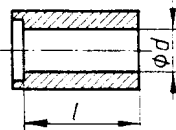
No.	Diagram	Object	Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
			mm	in		
G3		<p>Measurement of run-out of the taper or of the internal centring register of the spindle :</p> <p>a) at the outlet of the housing;</p> <p>b) at a distance from the outlet equal to $\frac{Da^*}{2}$ [100 mm (4 in) minimum and 300 mm (12 in) maximum].</p>	<p>a) 0,005</p> <p>b) 0,015 for a measuring length of 300</p>	<p>a) 0.0002</p> <p>b) 0.0006 for a measuring length of 12</p>	<p>Test mandrel according to the type of spindle nose and dial gauge</p>	<p>Clause 5.612.3</p> <p>In the case of an internal taper, the test will be made with the aid of a mandrel.</p> <p>In the case of a cylindrical centring register, the test will be made with the aid of the dial gauge and without using a test mandrel. In this case, the value of a) will be taken as the permissible deviation.</p>
G4		<p>Checking of parallelism of the workhead spindle axis to the table movement (in the case of a moving workhead) or to the longitudinal movement of the grinding wheel spindle (in the case of a moving wheelhead) :</p> <p>a) in a horizontal plane;</p> <p>b) in a vertical plane.</p>	<p>a) 0,01 for a measuring length of 300</p> <p>b) 0,025 for a measuring length of 300 (Test mandrel end directed upwards)</p>	<p>a) 0.0004 for a measuring length of 12</p> <p>b) 0.001 for a measuring length of 12 (Test mandrel end directed upwards)</p>	<p>Test mandrel and dial gauge</p>	<p>Clauses 5.412.1 and 5.422.3</p>
G5		<p>C — GRINDING SPINDLE</p> <p>Measurement of run-out of the grinding wheel spindle (wheel mounting diameter) :</p> <p>a) at the outlet of the housing;</p> <p>b) at a distance equal to $\frac{Da^*}{2}$ [100 mm (4 in) minimum and 200 mm (8 in) maximum]</p>	<p>a) 0,01</p> <p>b) 0,02 for a measuring length of 200</p>	<p>a) 0.0004</p> <p>b) 0.0008 for a measuring length of 8</p>	<p>Test mandrel according to the type of spindle nose and dial gauge</p>	<p>Clause 5.612.3</p> <p>In the case of an internal taper, the test will be made with the aid of a mandrel.</p> <p>In the case of a cylindrical centring register, the test will be made with the aid of the dial gauge and without using a test mandrel. In this case, the value of a) will be taken as the permissible deviation.</p>

* Da = Maximum diameter admissible for workpiece.

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No.	Diagram	Object	Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
			mm	in		
G6		<p>Checking of parallelism of the grinding wheel spindle axis to the table movement in a vertical plane</p> <p>OR</p> <p>Checking of parallelism of the grinding wheel spindle axis to the longitudinal movement of the wheelhead in a vertical plane.</p>	<p>0,03 for a measuring length of 300 (Test mandrel end directed upwards)</p>	<p>0.0012 for a measuring length of 12 (Test mandrel end directed upwards)</p>	Test mandrel and dial gauge	Clauses 5.412.1 and 5.422.3
G7		Measurement of difference in height between the axis of workhead spindle and the axis of wheelhead spindle.	0,025	0.001	Dial gauge and special rest	<p>Clause 5.442</p> <p>The test shall be carried out in the vertical plane after having obtained alignment in the horizontal plane.</p>
	<p>Alternative</p> 					<p>Alternative</p> <p>Clause 5.432.1</p> <p>The test can be carried out with the dial gauge support set directly on the table.</p>
G8		<p>SWIVELLING WORKHEAD</p> <p>Checking of parallelism of the mounting face of the swivelling workhead to the cross traverse of the wheelhead.</p>	<p>0,01 for $l = 100$</p>	<p>0.0004 for $l = 4$</p>	Test mandrel and dial gauge	<p>Clause 5.412.1</p> <p>A reading shall be made when the workhead is locked in position A.</p> <p>Swivel the workhead towards its external position B.</p> <p>Move the cross slide so as to obtain the reading B.</p>
G9		Measurement of repeatability of the finish approach of the wheel slide (or the work slide)	0,002	0.00008	Dial gauge	Carry out six consecutive tests for the wheel slide positioning (or work slide positioning), the movement being obtained by a quick approach followed by a slow approach.

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No.	Diagram	Nature of test	Cutting conditions	Checks to be applied	Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230																														
					mm	in																																
P1	 <p>Dimensions in millimetres</p> <table><tr><th>D = Maximum admissible diameter for grinding</th><th>d</th><th>l</th></tr><tr><td>D < 40</td><td>15</td><td>25</td></tr><tr><td>40 < D < 80</td><td>30</td><td>50</td></tr><tr><td>80 < D < 150</td><td>60</td><td>100</td></tr><tr><td>D > 150</td><td>100</td><td>150</td></tr></table> <p>Dimensions in inches</p> <table><tr><th>D = Maximum admissible diameter for grinding</th><th>d</th><th>l</th></tr><tr><td>D < 1.6</td><td>0.6</td><td>1</td></tr><tr><td>1.6 < D < 3.2</td><td>1.2</td><td>2</td></tr><tr><td>3.2 < D < 6</td><td>2.4</td><td>4</td></tr><tr><td>D > 6</td><td>4</td><td>6</td></tr></table> <p>Material: steel</p>	D = Maximum admissible diameter for grinding	d	l	D < 40	15	25	40 < D < 80	30	50	80 < D < 150	60	100	D > 150	100	150	D = Maximum admissible diameter for grinding	d	l	D < 1.6	0.6	1	1.6 < D < 3.2	1.2	2	3.2 < D < 6	2.4	4	D > 6	4	6	Grinding of the bore of a test piece mounted on a plate.	Grinding along the whole length / (without arbor support)	a) Circularity (roundness) (deviation for circularity = difference between the maximum diameter and the minimum diameter of a section).	a) 0,005	a) 0.0002	Bore gauge	Clauses 3.1, 3.22, 4.1 and 4.2 Tests for circularity should be made at several positions of the test piece and the greatest value of the deviation obtained. The measurements for consistency of diameter shall be carried out in a single axial plane. NOTE — Any tapes should be such that the major diameter is near the workhead.
	D = Maximum admissible diameter for grinding	d	l																																			
D < 40	15	25																																				
40 < D < 80	30	50																																				
80 < D < 150	60	100																																				
D > 150	100	150																																				
D = Maximum admissible diameter for grinding	d	l																																				
D < 1.6	0.6	1																																				
1.6 < D < 3.2	1.2	2																																				
3.2 < D < 6	2.4	4																																				
D > 6	4	6																																				
b) Consistency of diameter : Variation of diameter measured at both ends and in the middle of the test piece.	b) 25:0,005 for/= 50:0,005 for/=100:0,010 for/=150:0,015	b) 1:0.0002 for/=2:0.0002 for/=4:0.0004 for/=6:0.0006																																				

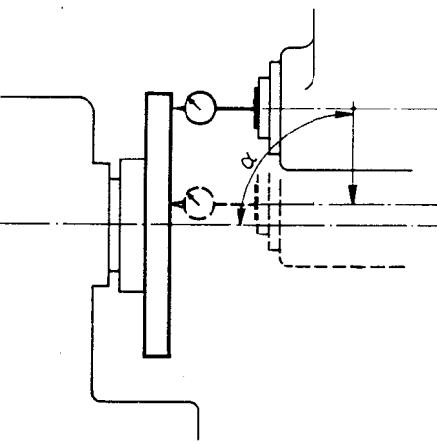
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COMPLEMENTARY GEOMETRICAL TESTS AND PRACTICAL TEST
(IN THE CASE OF A MACHINE HAVING A SURFACING WHEEL SLIDE)

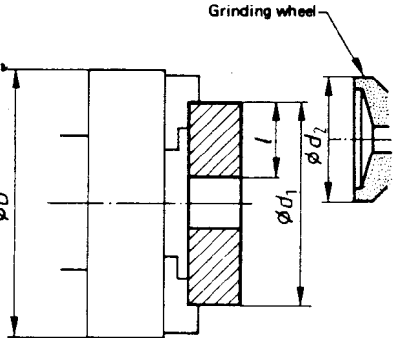
A.1 GEOMETRICAL TESTS

No.	Diagram	Object	Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
			mm	in		
AG 1		<p>a) Measurement of run-out of the surfacing wheel spindle (wheel mounting diameter);</p> <p>b) Measurement of periodic axial slip of the surfacing wheel spindle;</p> <p>c) Measurement of camming of the face of the spindle nose (including periodic axial slip)</p>	<p>a) 0,01</p> <p>b) 0,005</p> <p>c) 0,01</p>	<p>a) 0,0004</p> <p>b) 0,0002</p> <p>c) 0,0004</p>	Dial gauge	<p>a) Clause 5.612.2</p> <p>In the case of a tapered spindle nose the stylus of the dial gauge shall be set normal to the surface to be checked.</p> <p>b) Clauses 5.62, 5.621.2, 5.622.1, 5.622.2 and 5.632</p> <p>The existence and the value of axial force F to be applied shall be specified by the manufacturer.</p> <p>c) Clause 5.632</p> <p>The distance A of dial gauge c) from the spindle axis shall be as large as possible.</p>
AG 2		Checking of squareness of the flange face of the surfacing wheel spindle to the workhead spindle axis.	0,02/300°	0,0008/12°	Dial gauge and special support	<p>Clauses 5.512.1 and 5.512.42</p> <p>* Distance between the two points touched.</p>
AG 3		<p>Moving workhead</p> <p>Checking of parallelism of the surfacing wheelhead spindle axis to the longitudinal table movement :</p> <p>a) in a horizontal plane;</p> <p>b) in a vertical plane.</p> <p>Moving wheelhead</p> <p>Checking of parallelism of the surfacing wheelhead spindle axis to the longitudinal movement of the wheelhead :</p> <p>a) in a horizontal plane;</p> <p>b) in a vertical plane.</p>	<p>a) 0,01</p> <p>300</p> <p>b) 0,02</p> <p>300</p>	<p>a) 0,0004</p> <p>for a measuring length of 12</p> <p>b) 0,0008</p> <p>for a measuring length of 12</p> <p>(End of test mandrel directed upwards)</p>	Test mandrel and dial gauge	<p>Clauses 5.412.1 and 5.422.3</p>

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No.	Diagram	Object	Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
			mm	in		
AG 4		Checking of squareness of the transverse movement of the surfacing wheelhead to the workhead axis.	0,01/300 with $\alpha \geq 90^\circ$	0.0004/12 with $\alpha \geq 90^\circ$	Dial gauge and flat disc or straightedge	Clauses 5.522.3 and 3.22

A.2 PRACTICAL TEST

No.	Diagram	Nature of test	Cutting conditions	Checks to be applied	Permissible deviation		Measuring instruments	Observations and references to the test code ISO/R 230
					mm	in		
AP 1		Facing of a disc $d_1 < \frac{2D}{3}$ $l < \frac{2}{3}d_2$	The test piece is mounted on a face plate. Facing of a flat face perpendicular to the workhead spindle axis. The workhead spindle axis is set parallel to the slideways.	Flatness of the ground face.	0,01 for $d_1 = 300$	0.0004 for $d_1 = 12$	Straightedge and gauge blocks	Clauses 3.1 and 3.22, 4.1 and 4.2 The machined test piece shall be flat or concave.

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